National and International Reanalysis Efforts

Plans for Reanalysis at NCEP EMC

Suru Saha

- Emphasis on coupled DA and forecasting
  - Subseasonal to 6 weeks, seasonal to 6 months
  - Utilize cloud computing and storage?
- DA – upgrade to hybrid 4DEnVar
  - Include aeorosols, sea ice, land and ocean
- Physics - scale-aware PDF-based subgrid scale turbulence and cloudiness scheme
  - Aerosols, with consistent microphysics, convection, cloudiness, radiation interaction.
  - Non-orographic GWD
- Hybrid gain 3DVar/LETKF GODAS, NSST development.

Issues and Requirements for Climate Reanalysis

Arun Kumar

- Needs for reanalysis
  - monitoring
  - attribution
  - societal applications
  - forecasts: to initialize, provide base climo for bias correction, verify and re-calibrate models.
- Challenges
  - Dealing with discontinuties (arising from interaction with model bias and obs platforms changes)
  - connecting different reanalysis efforts
  - Balancing requirements for reforecasts vs climate monitoring/analysis/attribution.

Reanalysis at ECMWF

Dick Dee

- Coming attractions:
  - ERA5 (successor for ERA-interim, T639L137, 10 member EDA, 79-present, all-sky radiances, varBC for everything)
  - ERACLIM -> ERACLIM2 (coupled land/atmos/ocean/sea ice/biogeochem)
  - Copernicus climate change services (includes operational support for reanalysis).

CMA reanalysis plans

Zhiquan Liu

- Satellite era (79-present), ***near-real time*** 30km resolution.
- land-surface reanalysis
- Old version of IFS (T639), using GSI 3DEnVar (T213 ensemble). DART for land surface.

MERRA2

Ron Gelaro

- address limitations of MERRA1, using recent version of GEOS5 (0.5 degree L72, 3dvar)
  - new sat types
  - reduce spurious trends
  - reduce imbalances in water and energy cycles.
  - test coupling methodogy
- Done 1980-2015, real time with 2-3 week latency. Release in July. Hourly surface and 2d fields. 20% of total will be aerosols.
- MERRA2 driven chem, ocean and land analyses to follow.
- MERRA-next will be atmos/ocen/ice/land coupled, 0.25 deg atmosphere and 25km ocean withhybrid 4DEnVar atmos, EnKF land, EnOI ocean.

Discussion

a centralized database for reanalysis obs/innovation stats?

- Jack: de-centralized would be better, with communications software so different databases can talk to each other.
- Arlindo: can we scale with new sat instruments? (centralized not practical)
- Dick: standards for metadata is the most important thing.

- bridging gap between hindcasts and monitoring
  - R1 is still used because of near real-time aspect.
  - R1 most stable for long-term time series
  - Arun: shoot for unified reanalysis system in future, but in the meantime keep them separate.
- what advances in ocean coupling are appropriate now?
  - Ricardo - how to spin up oceans? Ron: using 'streams' is a problem
  - Dick Dee: ECMWF looking at sensitivity of deep oceans as it spins up. We cannot constrain deep oceans (only first few hundred meters).
  - Ricardo: What about using slab ocean then?
  - Jim Carton: some layers are operating on such long times scales we can't track them. Some we can (decadal and shorter time scales).
- Gil: If we're not uniformly better in each new iteration, how to we communicate that?